

What is claimed:

1. A multi-point seat belt for increasing survival chance of a passenger of a transport system in an accident or during in-flight turbulence, comprising

5 a first and second shoulder belt portion, a lap belt portion and an extending belt portion (1.1 to 1.4) and a first and second belt end (ER) and (EL), where

the extending belt portion (1.4), loosely guided by a shoulder-belt-portion deflector (5, 5b, 12) and having the second belt end (EL), is equipped with a belt retractor (13), having a clamping device and attached to a stiff fourth transport-system member, generally  
10 representing a floor of the transport system adjacent to a second seat-side or a seat-backrest frame at the second seat-side or a post section of a motor vehicle adjacent to the second seat-side;

the first shoulder belt portion (1.1) has the first belt end (ER) and is attached to a stiff third transport-system member, generally representing the floor of the transport system  
15 adjacent to a first seat-side or the seat-backrest frame at the first seat-side;

a main buckle assembly (9.1), having a master release button (84) and attached to a stiff first transport-system member, generally representing the floor of the transport system adjacent to the first seat-side or a seat-cushion frame at the first seat-side or a mid-tunnel of the motor vehicle adjacent to the first seat-side;

20 at least one latch plate (2, 2a, 9, 11, 25);

a lower belt deflector (17), deflecting and loosely guiding the lap belt portion (1.3) or the first shoulder belt portion (1.1) and attached to a stiff second transport-system member, generally representing the floor (6) of the transport system adjacent to the second seat-side or the seat-cushion frame at the second seat-side or the post section adjacent to the second  
25 seat-side or a side rail of the motor vehicle adjacent to the second seat-side; and

a belt-feeding device, provided with an operating arm (20.2), to a first end of which a belt ring (20.8) is rigidly attached to receive and loosely guide the first shoulder belt portion and a second end is connected to a guide tube (20.1), pivotally attached to a bearing casing (20.10) of the seat-backrest frame;

30 whereby

a lower body (96) of the passenger and an upper body (95) are restrained by the lap- and second shoulder belt portions (1.3, 1.2) when the main latch plate (9), moveable along the lap- or second shoulder belt portion, is plug-in connected to the main buckle assembly (9.1); and

35 the upper body is restrained by the first and second shoulder belt portions, both (1.1, 1.2) extending crosswise in an X-shape upon a rotatory movement of the operating arm with the first shoulder belt portion from a resting position at the second seat-side to an operative position at the first seat-side.

2. The multi-point seat belt according to claim 1, further comprising at least one drive  
40 apparatus, which, provided for the belt-feeding device, when activated, rotates the operating arm with the first shoulder belt portion from the resting position to the operative position or vice-versa.

3. The multi-point seat belt according to claim 2, wherein the master release button (84),  
45 when depressed, releases the main latch plate and returns the belt-feeding device to the resting position.

4. The multi-point seat belt according to claim 3, wherein the master release button (84) is provided with a release wire connecting to the drive apparatus where the master release button, when depressed, releases the main latch plate from the main buckle assembly and returns the belt-feeding device to the resting position.

5. The multi-point seat belt according to claim 1, wherein the multi-point seat belt (1, 1a to 1d) consists of

a three-point seat belt (1e);

an upper first shoulder belt (1.12),

a first belt end of which is provided with a transition buckle assembly (4e), having a

transition release button (84c), in a home position is located on a seat-backrest aperture of the seat backrest at the first seat-side, and

a second belt end is attached to the seat-backrest frame at the first seat-side; and

a transition latch plate (2), attached to a first belt end of a lower first shoulder belt portion (1.11) of the three-point seat belt (1e);

whereby

in a coupling position the transition latch plate (2) is plug-in connected to the transition buckle assembly (4e), pulled out from the seat-backrest aperture, therethrough a transition portion of the upper first shoulder belt is projected, where the lower first shoulder belt portion (1.11) projects through the lower belt deflector (17) at a sufficient length (l<sub>1</sub>) needed for the belt retractor to retract the first shoulder belt portion of the restrained passenger, defined by the lower first shoulder belt portion and the transition portion, in the accident.

6. The multi-point seat belt according to claim 5, wherein the second end of the upper first shoulder belt (1.12) is provided with a second belt retractor (13a), which, attached to the seat-backrest frame at the first seat-side, has a spring force, which is less than that of the belt retractor (13),

whereby

in the coupling position the belt retractor pulls the upper first shoulder belt out from the second belt retractor through the seat-backrest aperture or

in the home position the transition buckle assembly (4e), released by depressing the transition release button, is pulled by the second belt retractor until being located on the seat-backrest aperture.

7. The multi-point seat belt according to claim 5, wherein the transition buckle assembly is provided with an electrical release-motor (4.2b), which, when receiving an electrical signal from the main buckle assembly resulting from depressing the main release button releasing the main latch plate, pulls the transition release button to release the transition latch plate.

8. The multi-point seat belt according to claim 1, wherein the lower belt deflector (17) comprises a housing, having an attachment hole, and a pin (17.1), attached in the housing to form an aperture loosely guiding the belt portion.

9. The multi-point seat belt according to claim 8, wherein the pin (17.1) is surrounded by a sleeve (17.2).

10. The multi-point seat belt according to claim 9, wherein the lower belt deflector (17) is made of one piece.

11. The multi-point seat belt according to claim 3, further comprising

a key, rigidly attached to the belt ring of the operating arm; and  
a belt-feeding plate (20.9, 20.9a), a contact portion of which, moveable in an opening of the  
seat backrest at the first seat-side and guided thereby, has a receptacle through which the  
key projects in a contact position and the operative position;

5 whereby the drive apparatus, being activated,  
moves up over a head rest the contact portion of the belt-feeding plate out of the opening  
and the guide tube with the operating arm and with the first shoulder belt portion;  
rotates the operating arm and the first shoulder belt portion over the head rest, a head of the  
passenger and in front of his upper body until the key engages with the receptacle in the  
10 contact position and  
countersinks the contact portion and the guide tube with the operating arm in the seat  
backrest until reaching the operative position in which the first shoulder belt portion  
extends across over his upper body and, finally, the drive apparatus is switched off;  
where in the operative position or in the resting position the contact portion of the belt-  
15 feeding plate and the guide tube with the operating arm are countersunk in the seat backrest.

12. The multi-point seat belt according to claim 11, wherein a radial-adjustable tube (20.3) is  
attached between the belt ring and the guide tube, where the first shoulder belt portion is  
moved from the resting position to the operative position by a radial-adjusting movement of  
the radial-adjustable tube when the drive apparatus is activated.

20 13. The multi-point seat belt according to claim 11, wherein the drive apparatus is operable  
to return the first shoulder belt portion (1.1) from the operative position to the resting  
position, when a dwell time, predetermined for an engagement of the key with the receptacle,  
is exceeded.

25 14. The multi-point seat belt according to claim 11, wherein the drive apparatus returns the  
first shoulder belt portion (1.1) from the operative position to the resting position, when a  
dwell time, predetermined for inserting the main latch plate into the main buckle assembly, is  
exceeded.

30 15. The multi-point seat belt according to claim 11, wherein the drive apparatus, activated in  
response to activating a switch, attached in the main buckle assembly (9.1), upon contact with  
a cam of the main latch plate (9), when inserted therein, is switched off when the operative  
position is reached.

16. The multi-point seat belt according to claim 11, wherein the drive apparatus, activated in  
response to starting an engine of the transport system, is switched off when the operative  
position is reached.

35 17. The multi-point seat belt according to claim 11, wherein the drive apparatus, activated in  
response to closing a vehicle door of the transport system, is switched off when the operative  
position is reached.

18. The multi-point seat belt according to claim 11, wherein the drive apparatus, activated in  
response to actuating a switch, is switched off when the operative position is reached.

40 19. The multi-point seat belt according to claim 11, wherein the drive apparatus is activated  
when the passenger takes a seat, whereto a sensor is built, where the drive apparatus is  
switched off when the operative position is reached.

20. The multi-point seat belt according to claim 11, wherein the drive apparatus, activated in response to depressing x-times the master release button (84), is switched off when the operative position is reached.

21. The multi-point seat belt according to claim 11, wherein the supplement latch plate is a belt-detachable latch plate (25), which has a quick-release pin (25.1) and a U-shaped portion to house the belt portion of the seat belt which is secured therein by the quick-release pin and detached therefrom by pulling it.

22. The multi-point seat belt according to claim 21, wherein the seat backrest at the first and second seat-side is provided with pairs of supplement upper buckle assemblies (18 / 19, 18a / 19a, 18b / 19b, 18.1 / 19.1 to 18.3 / 19.3), one of which is adapted to a small body proportion of the passenger, lower than the upper buckle assembly, and, finally, the belt-detachable latch plates, housing both shoulder belt portions, are plug-in connected to that pair.

23. The multi-point seat belt according to claim 22, wherein the belt-detachable latch plates, when not being used, are stored and secured in a storage box (25.5) of the seat.

24. The multi-point seat belt according to claim 22, wherein the upper buckle assembly is provided with a coupling fitting (1.2a, 1.2b) to receive energy absorbers.

25. The multi-point seat belt according to claim 22, wherein the master release button (84) is provided with release cables (4.2), connecting to release buttons of all the supplement upper buckle assemblies, and with a release wire, connecting to the drive apparatus, where the master release button, when depressed, releases all the latch plates from the respective buckle assemblies and returns the belt-feeding device to the resting position.

26. The multi-point seat belt according to claim 25, wherein a belt-catching member (20.7, 20.7a), attached to the seat backrest, intercepts and holds at least one shoulder belt portion when being in the resting position.

27. The multi-point seat belt according to claim 4, further comprising a pair of rollover tubes (20.2b), inserted into a pair of angle fittings (26a) of the seat-backrest frame (3.4d); a belt housing (20.4d), which, moveable along the pair of rollover tubes and guided thereby, receives and loosely guides the first shoulder belt portion; and an additional drive apparatus, fastened to the belt housing and moveable along a threaded spindle (20.1a), fastened to the pair of angle fittings (26a); whereby the first shoulder belt portion is moved from the resting position to the operative position by a translatory movement of the belt housing and the rotatory movement of the operating arm when both drive apparatus are activated.

28. The multi-point seat belt according to claim 27, wherein the translatory movement of the belt housing and the rotatory movement of the operating arm are synchronised.

29. The multi-point seat belt to protect the passenger in a rollover-accident according to claim 28, wherein the belt-feeding device (20c, 20d) serves as a protective-rollover device having the pair of rollover tubes (20.2b), along which the belt housing (20.4d), having holes to receive a pair of legs of a safety bracket (20.6), is moved in the operative position, where

holes of one of the rollover tubes **(20.2b)** and the holes of the belt housing are aligned with each other and in excess of a threshold value in the rollover-accident the pair of legs of the safety bracket protrudes through all the holes, thus blocking the translatory movement of the belt housing and clamping the first shoulder belt portion.

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30. A multi-point seat belt for increasing survival chance of a passenger of a transport system in an accident or during in-flight turbulence, comprising  
a first and second shoulder belt portion, a lap belt portion and an extending belt portion **(1.1 to 1.4)** and a first and second belt end **(ER)** and **(EL)**, where  
10 the extending belt portion **(1.4)**, loosely guided by a shoulder-belt-portion deflector **(5, 5b, 12)** and having the second belt end **(EL)**, is equipped with a belt retractor **(13)**, having a clamping device and attached to a stiff fourth transport-system member, generally representing a floor of the transport system adjacent to a second seat-side or a seat-backrest frame **(3.4d)** at the second seat-side or a post section of a motor vehicle  
15 adjacent to the second seat-side; and;  
the first shoulder belt portion **(1.1)** has the first belt end **(ER)** and is attached to a stiff third transport-system member, generally representing the floor of the transport system adjacent to a first seat-side or the seat-backrest frame at the first seat-side;  
a main buckle assembly **(9.1)**, having a master release button **(84)** and attached to a stiff first  
20 transport-system member, generally representing the floor of the transport system adjacent to the first seat-side or a seat-cushion frame at the first seat-side or a mid-tunnel of the motor vehicle adjacent to the first seat-side;  
at least one latch plate **(2, 2a, 9, 11, 25)**;  
a lower belt deflector **(17)**, deflecting and loosely guiding the lap belt portion **(1.3)** or the  
25 first shoulder belt portion **(1.1)** and attached to a stiff second transport-system member, generally representing the floor **(6)** of the transport system adjacent to the second seat-side or the seat-cushion frame at the second seat-side or the post section adjacent to the second seat-side or a side rail of the motor vehicle adjacent to the second seat-side; and  
a belt-feeding device, consisting of  
30 a pair of rollover tubes **(20.2b)**, inserted into a pair of angle fittings **(26a)** of the seat-backrest frame **(3.4d)**;  
a belt housing **(20.4d)**, which, moveable along the pair of rollover tubes from a resting position at the second seat-side to an operative position at the first seat-side and guided thereby, receives and loosely guides the first shoulder belt portion; and  
35 a drive apparatus, fastened to the belt housing and moveable along a threaded spindle **(20.1a)**, fastened to the pair of angle fittings **(26a)**;  
whereby  
a lower body **(96)** of the passenger and an upper body **(95)** are restrained by the lap- and second shoulder belt portions **(1.3, 1.2)** when the main latch plate **(9)**, moveable along the  
40 lap- or second shoulder belt portion, is plug-in connected to the main buckle assembly **(9.1)**; and  
the upper body is restrained by the first and second shoulder belt portions, both **(1.1, 1.2)** extending crosswise in an X-shape upon a translatory movement of the belt housing with the first shoulder belt portion from the resting position to the operative position in  
45 response to the drive apparatus being activated.